repl
Aesculus glabra

SILVICAL CHARACTERISTICS of

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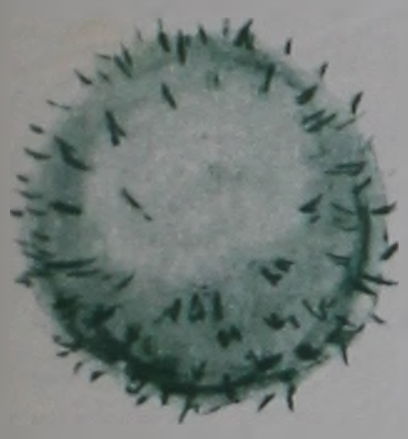
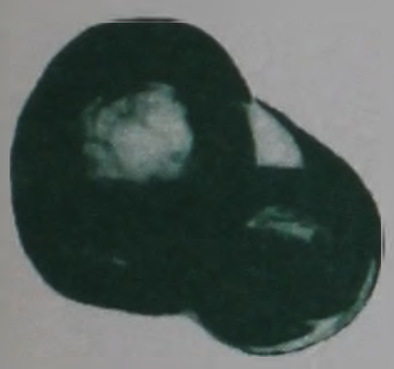
OHIO BUCKEYE





Robert W. Merz

Central States Forest Experiment Station Miscellaneous Release 16
U. S. Department of Agriculture . . . . . Forest Service

Seedling Development

Probably most buckeye trees originate as seedlings but no reports are available concerning the reproduction of the species. General observation indicates that moist, deep soils are desirable for successful seedling establishment. No germination has been observed where the surface soil was dry even though ample seed was present. The seed ordinarily germinates in the spring after lying on the ground over winter. Tests under controlled conditions have shown 28 percent germination.

It is believed that the seedlings will grow under some shade, although buckeye seems to develop best as isolated individuals in openings along streambanks.

Sapling Stage To Maturity

Growth Rates and Size Attained.--Buckeye generally develops a strong taproot the first year. Most of the shoot growth occurs early in the growing season. This tree has a moderate growth rate. As a sapling it grows faster than most of the oaks, but slower than yellow-poplar. In open situations it is characteristically branchy with a rather short, knotty trunk. It seldom attains heights exceeding 70 feet and diameters larger than 24 inches.

Fifty buckeye trees measured in Jefferson County, Indiana, were reported to average 68 feet in height and 2 feet 9 inches in diameter 3 feet above the ground (9). Apparently these trees were much larger in diameter than buckeye normally becomes, although the diameter measurement was made at a point lower on the bole than standard breast height (4 1/2 feet). Betts (2) states that buckeye generally does not grow taller than 30 feet and that 70 feet is the maximum.

Buckeye grows fairly rapidly on good sites but very slowly on poor sites where it usually is eventually suppressed by other species. On good sites the tree will attain usable sawtimber size at 60 to 80 years of age. On poor sites it seldom has good enough form or attains a large enough size to yield sawtimber.

Reaction to Competition.--Observation indicates that buckeye is of intermediate tolerance. Its ability to maintain itself as an associate of the trees in the very tolerant beech-maple type clearly indicates it is somewhat tolerant of shade. The species only attains good form as a timber tree when it is found in reasonably dense stands. So if it is grown for wood products, it should be retained in somewhat crowded conditions. An open-grown tree has little commercial value.

Buckeye saplings and poles can be expected to respond to overhead release but side release should be very conservative. Side competition and shade will result in a straight bole and encourage natural pruning of this tree that tends to have a large, branchy crown anyway.

Although there are no records concerning the ability of buckeye to produce epicormic branches, it appears very likely that trees that are released from side competition might have this tendency. Trees that tend to produce branchy, spreading crowns when in openings usually produce epicormic branches when additional light is given them by cutting nearby trees.

Climax Position and Place in Succession.--The Forest Cover Types of North America (16) does not list Ohio buckeye as a component or an associate of any forest type. This is probably because it is unimportant as a timber tree. However, buckeye may be considered as a very minor component constituent of at least two important types--northern red oak-basswood-white ash, which is a sub-climax type; and beech-sugar maple, which is a climax type. Both of these types are found in portions of the broad central hardwood forest. Undoubtedly, the tree is also a minor constituent of other types of a mesophytic nature that often are climax or sub-climax in the region they occur.

Buckeye is not a pioneer species and thus is seldom found on old fields or spoil-bank sites.

SPECIAL FEATURES

The bark of buckeye is smooth and gray onyoung trees and as the tree ages, it becomes ashy gray, very thick and densely furrowed, and broken into large, scaly flakes. On older trees it may be 3/4 of an inch thick. The bruised bark or broken twigs, as well as the flowers, give off a disagreeable fetid odor; hence the common name, fetid or stinking buckeye. An extract of the bark has been used as an irritant of the cerebro-spinal system (8).

The wood is light, white, and close-grained but resists splitting. It is easily carved and for this reason is used for making artificial limbs. Early settlers planed straight sections of the wood into long, thin shavings to make summer hats (8). The wood is also sawed into lumber for many uses, and it is sometimes used for woodenware, pulp, and veneer. The tree is sometimes planted as an ornamental and is the state tree of Ohio.

Buckeye leafs out very early, usually before most of the trees found in association with it. This characteristic makes it very easy to identify buckeye trees in a forest stand from a distance in early spring.

RACES AND HYBRIDS

There are no known races of buckeye but several hybrids are reported. Little (12) lists Aesculus x bushii which is a cross between A. glabra and A. pavia. Sargent (14) considers A. bushii a hybrid of A. discolor var. mollis and A. glabra var. leucodermis. This tree was found near Fulton, Arkansas. Sargent reports another hybrid that occurs near Starkville, Mississippi that he lists as a cross between A. discolor var. mollis and the typical A. glabra. He also lists A. mississippiensis as being a probable cross between A. glabra and A. pavia. This is the same hybrid that Little (12) lists as Aesculus x bushii.

TREE SPECIES MENTIONED

White Ash	-	Fraxinus americana L.
American basswood	-	Tilia americana L.
Beech	-	Fagus L.
Ohio buckeye	-	Aesculus glabra Willd.
Black cherry	-	Prunus serotina Ehrh.
Kentucky coffeetree	-	Gymnocladus dioicus (L.) K. Koch
American elm	-	Ulmus americana L.
Hackberry	-	Celtis occidentalis L.
Shagbark hickory	-	Carya ovata (Mill.) K. Koch
Honeylocust	-	Gleditsia triacanthos L.
Sugar maple	-	Acer saccharum Marsh.
Red mulberry	-	Morus rubra L.
Bur oak	-	Quercus macrocarpa Michx.
Chinkapin oak	-	Q. muehlenbergii Engelm.
Black walnut	-	Juglans nigra L.
Yellow-poplar	-	Liriodendron tulipifera L.

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This is the second of a series of 17 papers dealing with the silvical characteristics of forest trees important in the Central States region. The following species are included in this series:

Ohio buckeye
Yellow buckeye
Northern red oak
Black oak
Chinkapin oak
Pin oak
White oak
Swamp white oak
Bur oak
Butternut
Black walnut
Shellbark hickory
Sycamore
Honeylocust
Hackberry
Black locust
Eastern redcedar

Papers covering additional important American species will be issued by other Forest Experiment Stations of the U. S. Forest Service.

Central States Forest Experiment Station, U. S. Dept. of Agriculture
Forest Service, 111 Old Federal Building, Columbus 15, Ohio
W. G. McGinnies, Director

September 1957

Photo courtesy of Ohio Agricultural Experiment Station
Wooster, Ohio

Silvical Characteristics of Ohio Buckeye

ROBERT W. MERZ, forester
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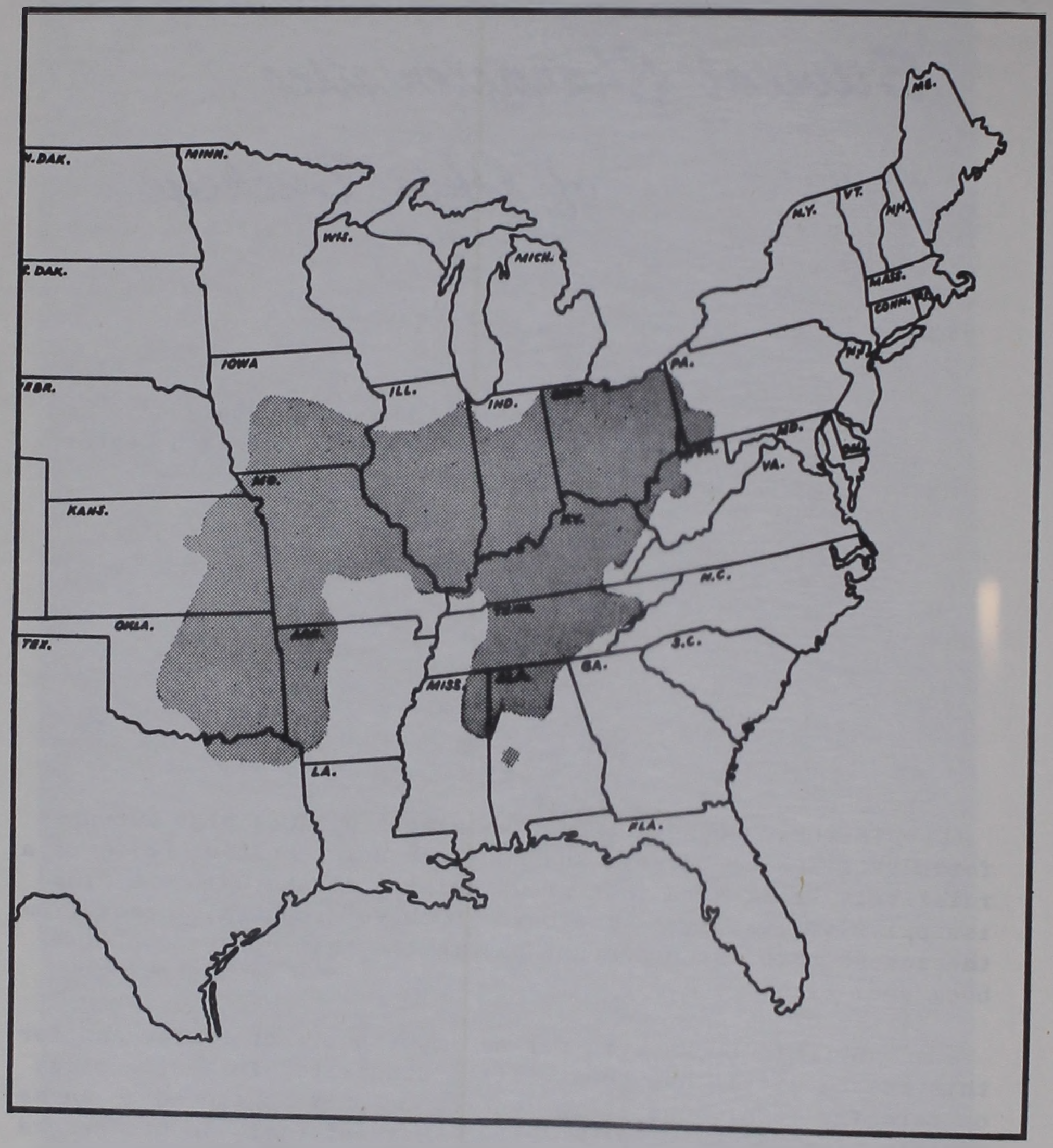
The Ohio buckeye (Aesculus glabra Willd.) also known as fetid or stinking buckeye and American horsechestnut (8)[1/], is a relatively small tree that grows chiefly in the Ohio and Mississippi River valleys. The name "buckeye" reputedly comes from the resemblance the brown nut has to the half-opened eye of a buck deer (11).

The Ohio buckeye is not an important timber tree and for this reason little has been written about it. In most ecology or forestry references it is ignored or only mentioned as an associate of more important species. Sargent (14), in his second edition of the Trees of North America in 1921, stated that the Ohio buckeye was "nowhere abundant." Ohio became known as the Buckeye State because of Michaux who reported many of these trees along the Ohio River in his travels in 1810 (8).

1/ Numbers in parentheses refer to Literature Cited, p. 11.

DISTRIBUTION



Ohio buckeye is largely confined to the Central States region that is drained by the Ohio and Mississippi Rivers (8, 9) (above). It has also been introduced successfully into Minnesota, western Kansas, and eastern Massachusetts (10).

HABITAT CONDITIONS

Climate

The climatic conditions (18) within the range of buckeye do not vary greatly, although there is a difference in the length of growing season between the northern and southern parts of the region where it is found. Average annual temperature varies from 50 to 60 degrees Fahrenheit. Average minimum temperatures are no lower than -20 degrees and average maximums seldom exceed 105 degrees. The average annual precipitation varies from 35 to 50 inches with 20 to 25 inches occurring in the growing season. Snowfall averages 2 inches per year in the southern part of the range and as high as 40 inches in the extreme northern part. Maximum precipitation occurring within the range is 80 inches in the eastern portion of the range where as high as 40 inches sometimes comes in the growing season. The number of frost-free days varies from 160 in the north to 220 in the south.

Soils and Physiography

The buckeye is a moist-site species most frequently found along river bottoms and in rich, moist, streambank soils. Betts (2) reports it is often found on the moist soils of the Early Wisconsin Drift Plain in Indiana, and Shanks (15) states that buckeye and sugar maple were most prominent in the early 1800's on the slope phase of the Miami silty clay loam in Ohio. On this soil type buckeye made up about 5 percent of the forest stand.

Although buckeye is sometimes found on drier sites, such as those supporting oak-hickory stands, and on clayey soils, it usually grows rather slowly in these situations and seldom becomes dominant in the stands. Bruner (7) reports buckeye as a shrub or shrublike plant of dry habitats in the oak-hickory association of eastern Oklahoma where it is found occasionally; it commonly attains a height of only 4 or 5 feet.

The species is an associate in hardwood stands on moist sites in the limestone-sink-and-cave section of the Bluegrass region of Kentucky (5). It is also listed as an infrequent species of well-developed flood plains along the Missouri River in southeastern Nebraska (1).

Associated Species

Types and Associated Species.--Braun (5) lists buckeye as an associate of bur oak, chinkapin oak, white ash, hackberry, sugar maple, black walnut, black cherry, honeylocust, Kentucky coffeetree, shagbark hickory, American elm, and red mulberry in the Bluegrass region of Kentucky. In Indiana it constituted somewhat more than 6 percent of the number of trees in a mixed hardwood stand that contained 39 percent sugar maple, 11 percent American elm, and 16 percent black walnut. In another stand where beech, sugar maple, hackberry, and black walnut made up more than half the stand, buckeye constituted a little more than 10 percent.

In studies (4) reporting the composition of mixed mesophytic climax forests of Marion and Johnson counties in Indiana in 1819, it was found buckeye made up 5.5 and 1.6 percent, respectively, of the total stems. Less than 2 percent of the trees were over 18 inches in diameter. However, in individual townships, it made up as much as 16.8 percent of the total stems, ranking second only to beech in importance.

Deam and Shaw (9) point out that buckeye is a frequent or even a common tree in association with beech, sugar maple, and American basswood in the basin of the Wabash River.

It is not known if specific plants tend to be associated with buckeye to the extent that they could be considered as indicator plants for good buckeye sites. However, any plants known to be associated with good sites for mixed mesophytic hardwoods could be so considered.

Diseases.--Ohio buckeye is relatively free of diseases. It is susceptible to a leaf spot which begins as brown spots or blotches on the leaves and may eventually involve all the leaves, giving the tree a scorched appearance. This disease, while it may slow the current growth rate, does no permanent damage to the tree and can be controlled on ornamentals. Boyce (3) states that one of the powdery mildews (Uncinula flexuosa) attacks the leaves of buckeye.

Presumably, buckeye is susceptible to the many wood-rotting fungi that attack the heartwood of deciduous trees. Buckeye growing in forest stands, however, is usually relatively free of defect caused by decay.

Weather.--Because buckeye leafs out early in the spring, the young leaves are sometimes killed by frost. When this happens, the current year's growth is probably retarded to some extent. Apparently however, it is capable of withstanding severe winters, because the tree has been introduced successfully in Minnesota and Massachusetts.

The bole of the tree is not commonly damaged by frost, and the heavy branches of the crown are seldom damaged severely by heavy loads of sleet or snow. There is no evidence that buckeye is susceptible to sunscald.

Birds and Animals.--The large fleshy seeds of the buckeye are eaten by some animals. However, the seeds as well as the bark of this tree are reported to be poisonous to others. Tehon (17) states that the seed and bark of Aesculus native to Illnois contain a poisonous narcotic alkaloid. Van Dersal (20) states the young shoots of buckeye are poisonous to cattle, and Deam and Shaw (9) report that landowners in Indiana have exterminated buckeye in many areas because the seed is also poisonous to livestock. On the other hand, evidence that buckeye seeds are eaten by squirrels can be cited. In Ohio, Martin et al. (13) estimate that buckeye seed constitutes 2 to 5 percent of the food of the eastern fox squirrel (Sciurus niger) during the fall, winter, and spring seasons. Brown and Yeager (6), as a result of studies made in Ohio, list buckeye as an auxiliary food for squirrels that was sampled in September but not eaten in quantity.

It seems quite probable that the use of buckeye for food by animals is not a limiting factor in reproduction of this species.

Insects.--There is no evidence that buckeye has specific insect enemies that are of major importance. It is quite probable that many of the leaf-sucking insects, including aphids, leaf-hoppers, and others, are associated with this species as they are with many others. There are no pests, however, that are known to cause complete defoliation or infest the woody portions of the tree.

LIFE HISTORY

Seeding Habits

The flowers of buckeye are usually greenish or pale yellow and are very showy, but have a fetid, disagreeable odor. They are borne in clusters that appear after the leaves in the spring from March to May. The flowers are often polygamous, most of them having imperfect sterile pistils.

The fruit is a leathery capsule which may contain 1, 2, or 3 seeds. The young fruit is prickly and generally matures from September to mid-October. The seed is large with a thick, shining coat and a large, round, pale scar. When only one seed is produced, it is round or flat in shape, dark chocolate to chestnut brown in color, smooth and shiny with a large, light-colored scar resembling the pupil of an eye. If 2 or more seeds are produced in a single fruit, the seeds are often flattened on one or more sides or even angular in shape. The seed of buckeye contains no endosperm and the cotyledons are very thick and fleshy (19). Buckeye seed is dispersed from early September to late October, chiefly by gravity and animals, but sometimes by water (19).

The number of cleaned seed per pound may vary between 48 and 67 and they are usually 100 percent sound (19). The seed has a high moisture content and to avoid loss of viability it should not be subjected to excessive drying before sowing. No data on optimum storage conditions for the seed are available, but it is believed that viability will best be retained if seed is kept in sealed containers at temperatures slightly less than 32 degrees Fahrenheit.

Vegetative Reproduction

Buckeye, like most other hardwoods, sprouts, although no reports are available concerning its ability in this regard. It probably sprouts more vigorously when cut at an early age (30 to 40 years). Trees that appeared to originate from sprouts have been observed in stands in Ohio. As far as is known, no studies have been made to determine if buckeye can be reproduced by root cuttings or grafts